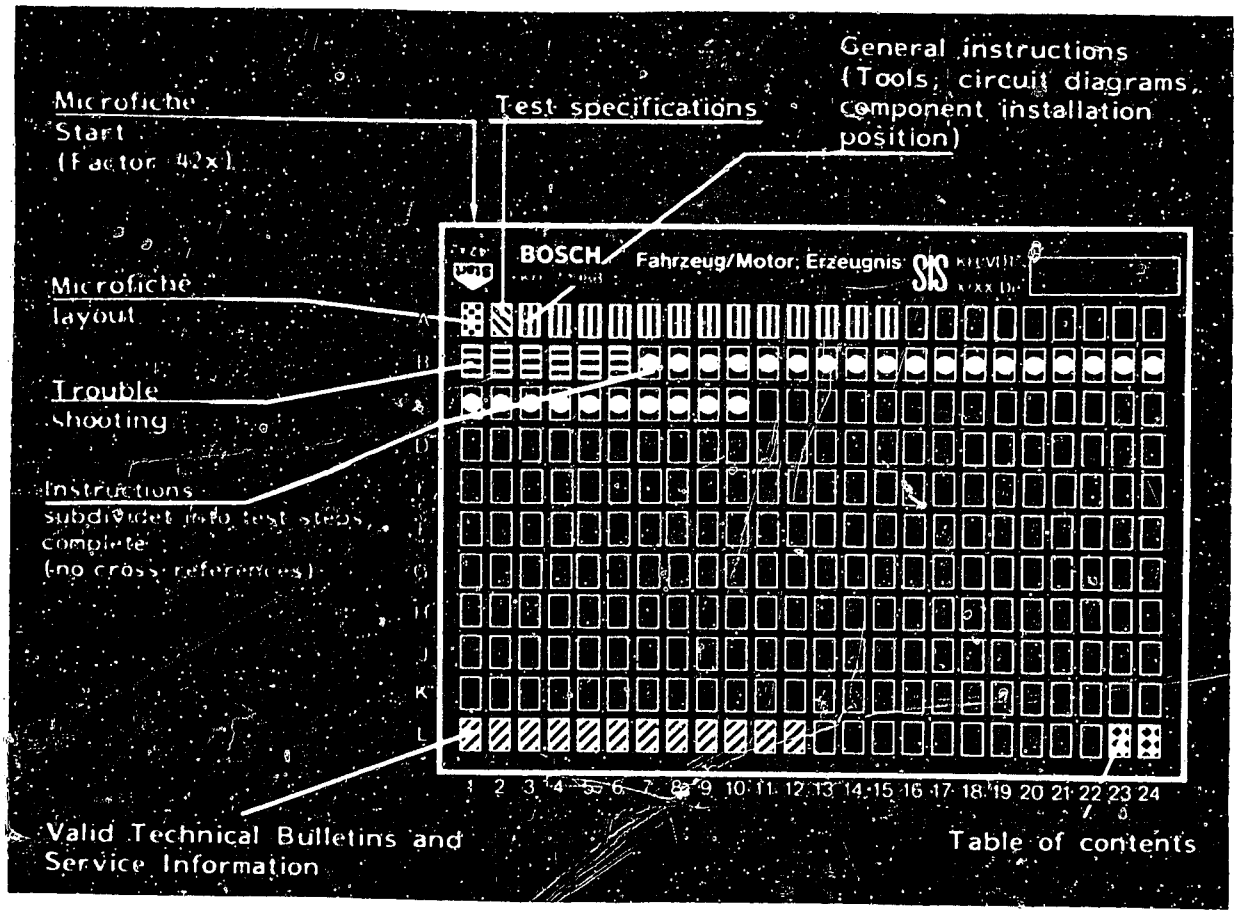
Structure of microfiche



1. Read from left to right

2. Title of microfiche (appears on each coordinate)

E 16	Product/assembly/test step	
	Vehicle/engine	

Coordinate

3. Limits of section

Beginning — Mid-section — End — One-page section

4. References to relevant test steps in test specifications; coordinate e.g. C6

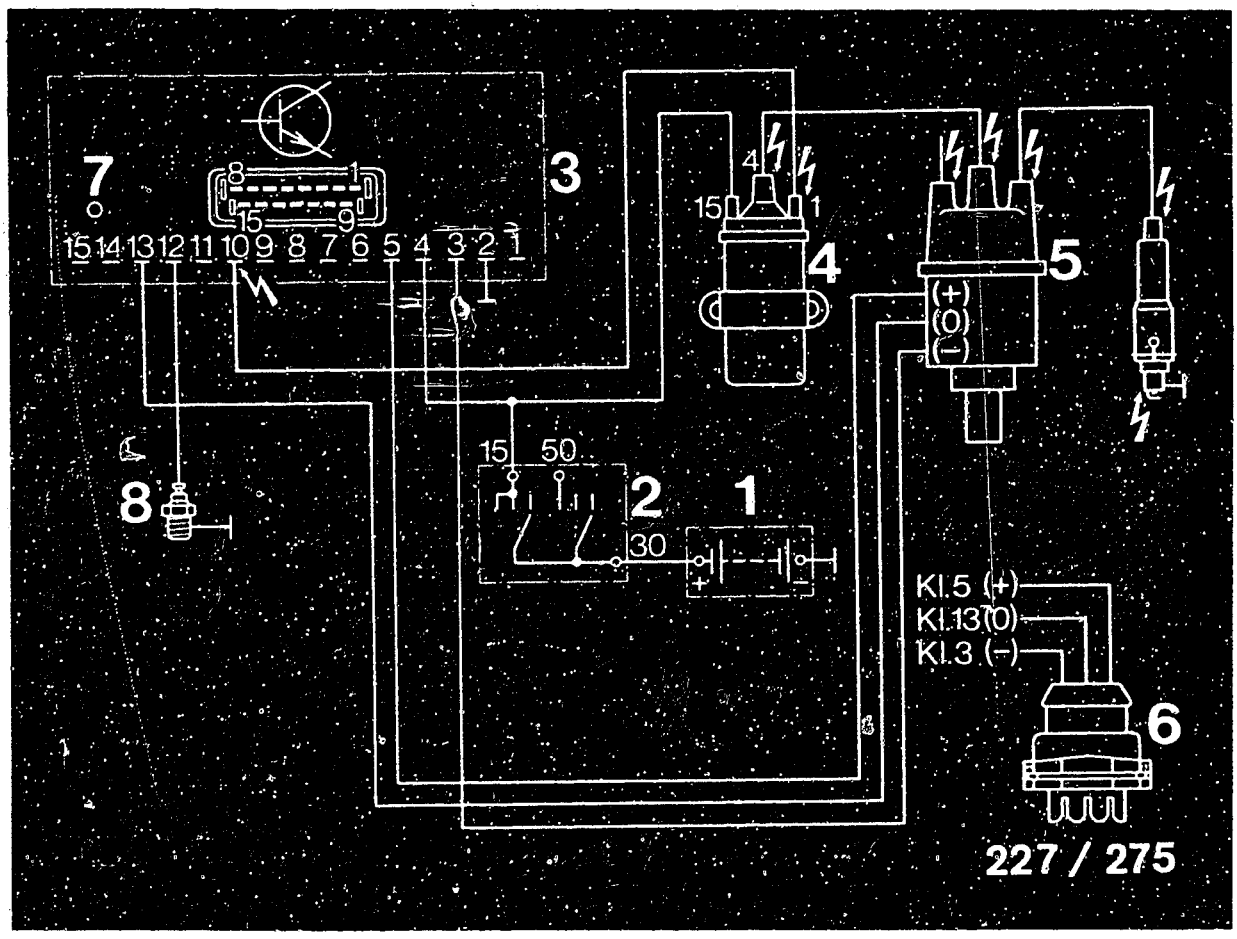
C6

A1 Trouble-shooting program

1. Test specifications

Ignition coil primary	0.5...0.9 Ω	B9
Ignition coil secondary	2.4...4.4 kΩ	
Basic ignition timing between 2000 and 2500 min^{-1} Temperature sensor disconnected	5 ± 1° BTDC	B15
Ignition pulse generator voltage supply	≧ 10 V	B17
Ignition coil voltage supply	≧ 10 V	
Temperature sensor 0° C =	1.9...2.9 kΩ	B19
+20° C =	0.7...1.3 kΩ	
+40° C =	400...600 Ω	
+60° C =	195...295 Ω	
+90° C =	82...122 Ω	
Primary voltage with engine idling	340...390 V	B23

See Autodata test specifications for settings for ignition, idle speed, exhaust gas, valve clearance etc.



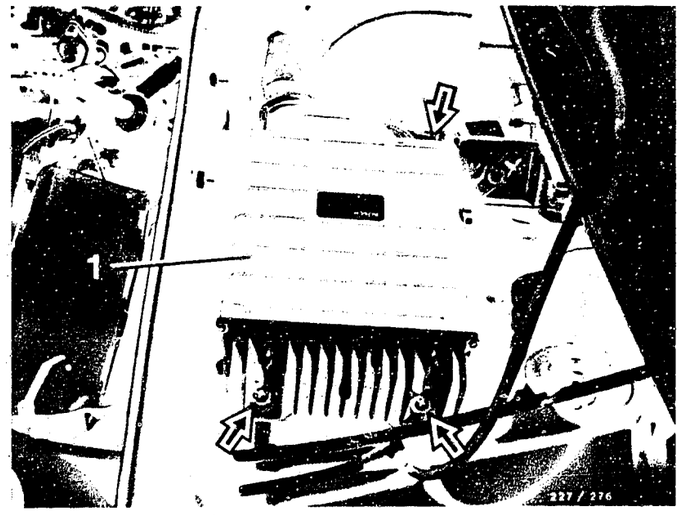
1 = Battery
2 = Ignition and starting switch
3 = Control unit
4 = Ignition coil
5 = Ignition distributor
6 = Ignition distributor connector
7 = Vacuum connnection
8 = Temperature sensor

= Dangerous voltages (400 V - 25 kV)

2. Electrical terminal diagram

3. Installation position of components

The control unit (see top picture) is in the water box (near wiper motor).

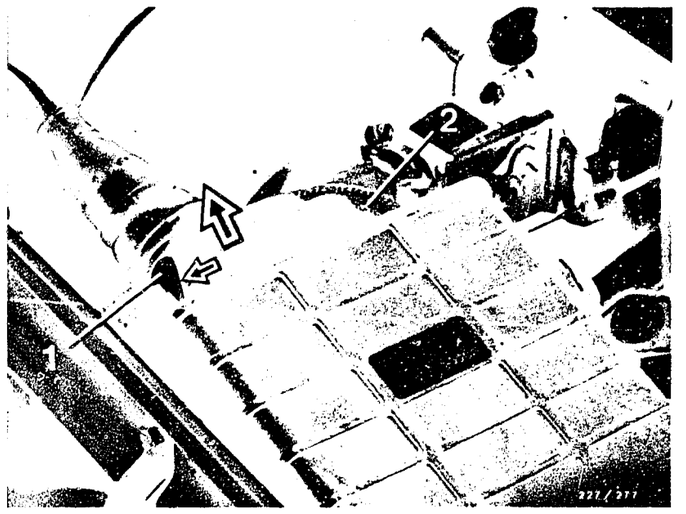


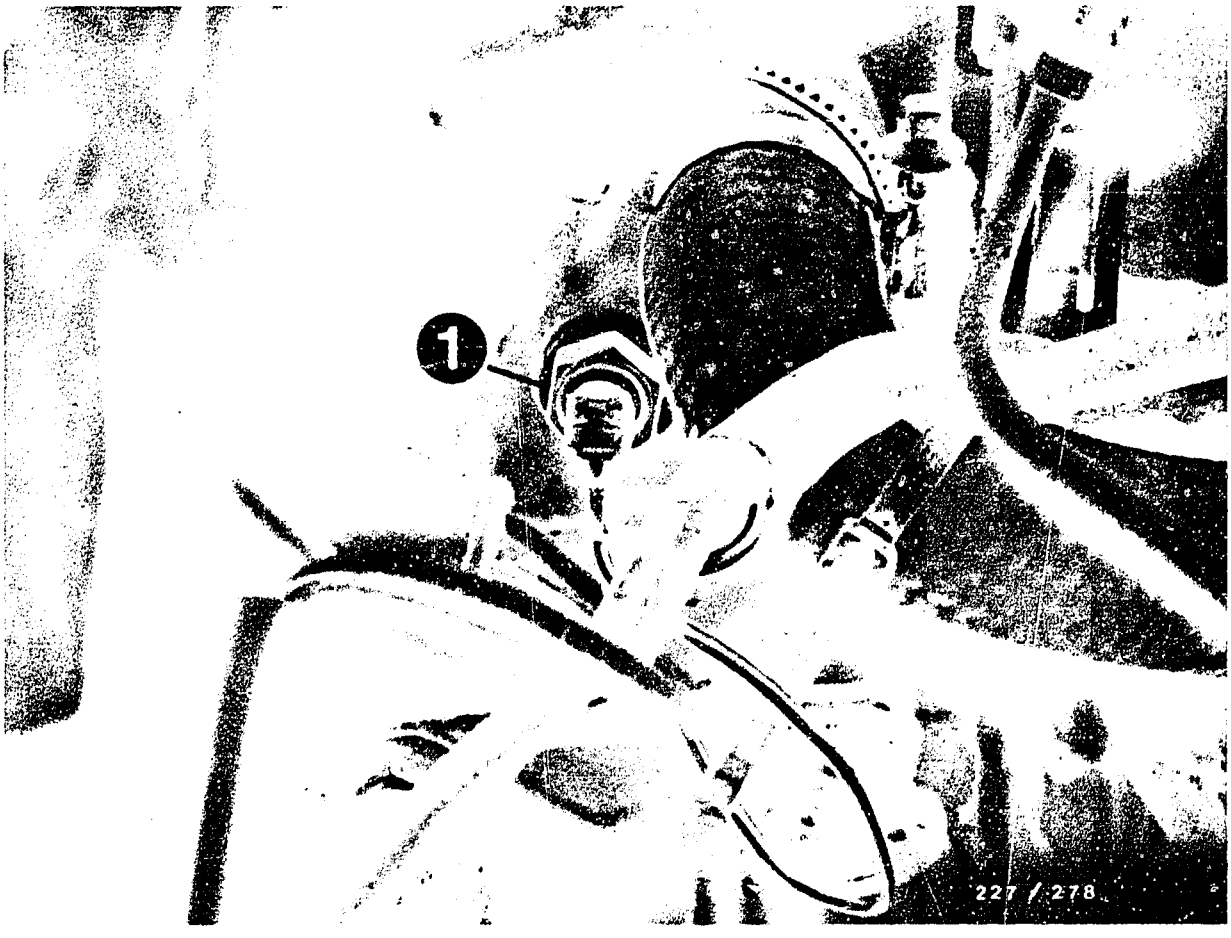
1 = Control unit

How to remove:

Remove water-box cover.
Press ratchet spring of control-unit plug in direction of arrow and unlatch plug (direction of arrow). See bottom picture. Remove vacuum hose. See bottom picture. Loosen 3 fastening screws. See arrows in top picture.

1 = Ratchet spring
2 = Vacuum hose





1 = Temperature sensor

The temperature sensor is on the thermostat housing (on left-hand side in forward direction of travel).

4. Necessary test equipment, aids

Motortester e. g.	MOT 201	0 684 000 201
Spark gap e. g. ignition coil and condenser tester	EFAW 106 A	0 681 100 001
or single spark gap	EF 1177/7	1 684 531 000
5 kΩ sleeve-type suppressor		0 356 500 001
Ohmmeter	ETE 014.00	0 684 101 400
or e. g.	Pontavi Wh2	commercially available
Voltmeter e. g.	ETE 014.00	0 684 101 400
Test prods		commercially available
Vacuum pump, e.g. Mityvac from Fa. Korinth Ludwig-Kloos-Str. 21 6450 Hanau 7-Steinheim		Commercially available

5. Danger of accident on electronic ignition systems

Increased demands of modern engines on the ignition system combined with the desire for freedom of maintenance have recently led to electronic ignition systems being fitted as standard. Usually the ignition power of electronic systems (of almost all manufacturers) is higher than that of conventional systems, and there are signs of further increases in power. Electronic ignition systems thus reach a power range which can be highly dangerous if live parts of terminals are touched (both on the primary as well as the secondary sides).

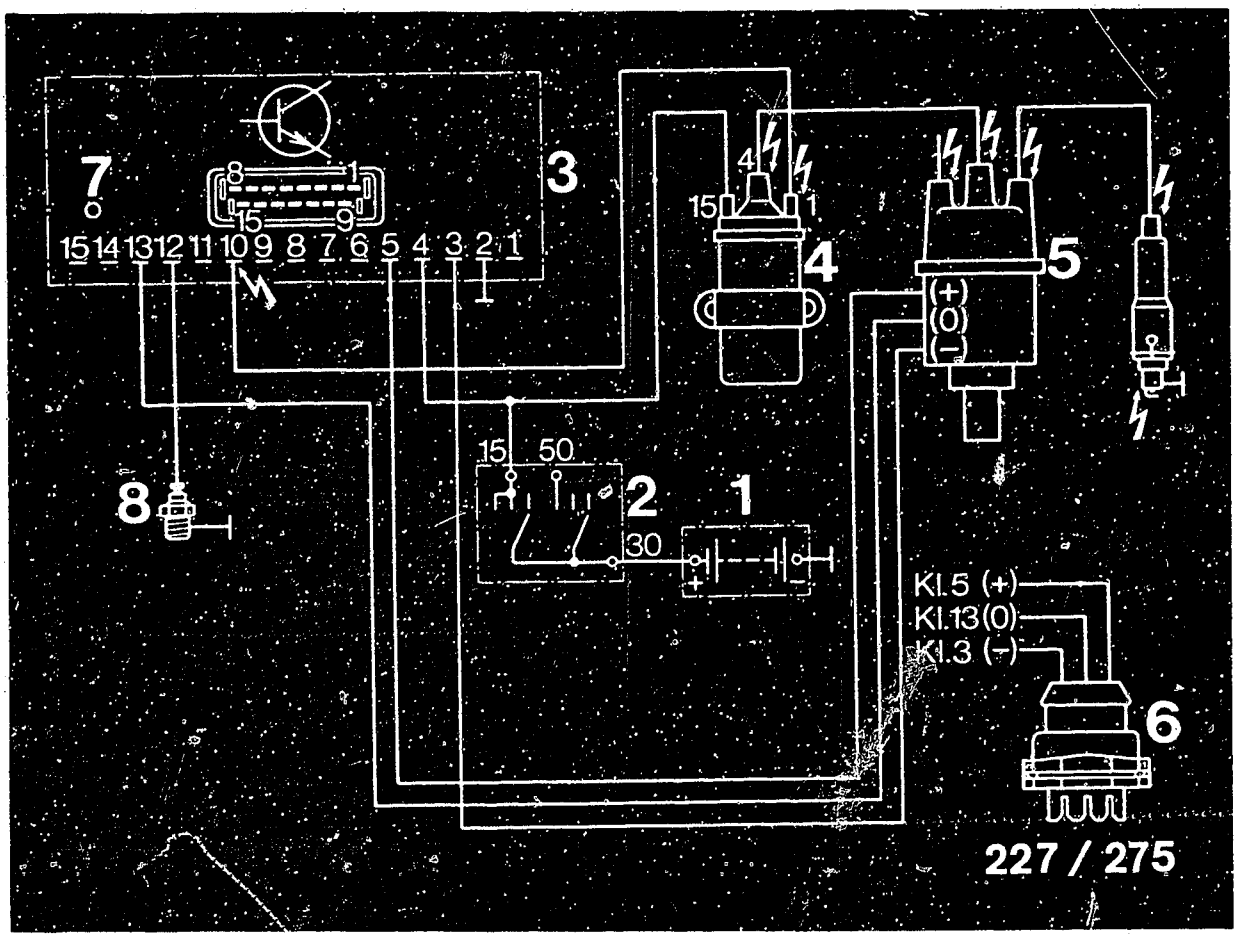
In this connection we should like to point out that the VDE regulations, in particular VDE 0104/7.67 and/or the respective national regulations must be followed when testing or working on the ignition system.

The ignition should always be switched off when working on the ignition system (switch off ignition or voltage source). Such work includes:

- Connecting of engine test equipment (timing light, dwell-tach tester, ignition oscilloscope etc.).
- Replacing parts of the ignition system (spark plug, ignition coil, ignition distributor, ignition cable etc.).

If, while testing the ignition system or during adjustment work on the engine (e. g. carburettor), it becomes necessary to switch on the ignition (switch on ignition or voltage source), the above-mentioned dangerous voltages occur over the entire system.

The danger of accident exists, therefore, not only on the individual assemblies of the ignition system (e. g. ignition distributor, ignition coil, trigger box, ignition harness), but also on the wiring harness (e. g. tachometer connection, diagnostic plug), at plug-in connections and test equipment.



1 = Battery
2 = Ignition and starting switch
3 = Control unit
4 = Ignition coil
5 = Ignition distributor
6 = Ignition distributor connector
7 = Vacuum connection
8 = Temperature sensor

= Dangerous voltages (400 V - 25 kV)

Electrical terminal diagram

The dangerous locations are identified with danger arrows taking the example of the terminal diagram of an electronic ignition system.

6. Incorrect indication of engine speed, dwell angle and ignition point

In ignition systems with control unit 0 227 400 005 (electronic ignition) with current-pulsed power output stage there may be an incorrect indication of engine speed, dwell angle and ignition point on testers.
For further information see Coordinates L7 - L11.

7. Important vehicle information

If the information on engine temperature fails to reach the control unit as a result of an open circuit or defective temperature sensor, there is no ignition timing advance or retard. If the ignition is correctly set, the ignition point is approx. 5° BTDC over the entire engine-speed range.
If the information on vacuum (load) fails as a result of leaky connections or a defective vacuum sensor in the control unit, there is a switch to a so-called emergency program. The ignition timing is then advanced by a small amount.

In the event of a failure of the information on engine temperature and manifold vacuum, the result may be poor driveability, reduced engine power and, possibly, higher fuel consumption.

- Resistance measurements must only be performed with the ignition switched off or with the battery disconnected (measuring instrument defective).

- When testing compression, remove control-unit plug or firmly ground ignition coil term. 4 using auxiliary cable (dangerous high voltage, insulation damage to ignition coil, ignition distributor, ignition harness).

Note:
The extra cable must be suppressed with at least 2 k Ω , e. g. with sleeve-type suppressor (5 k Ω) 0 356 500 001.

- The specified ignition coil (see Part No.) must not be replaced with a different ignition coil.

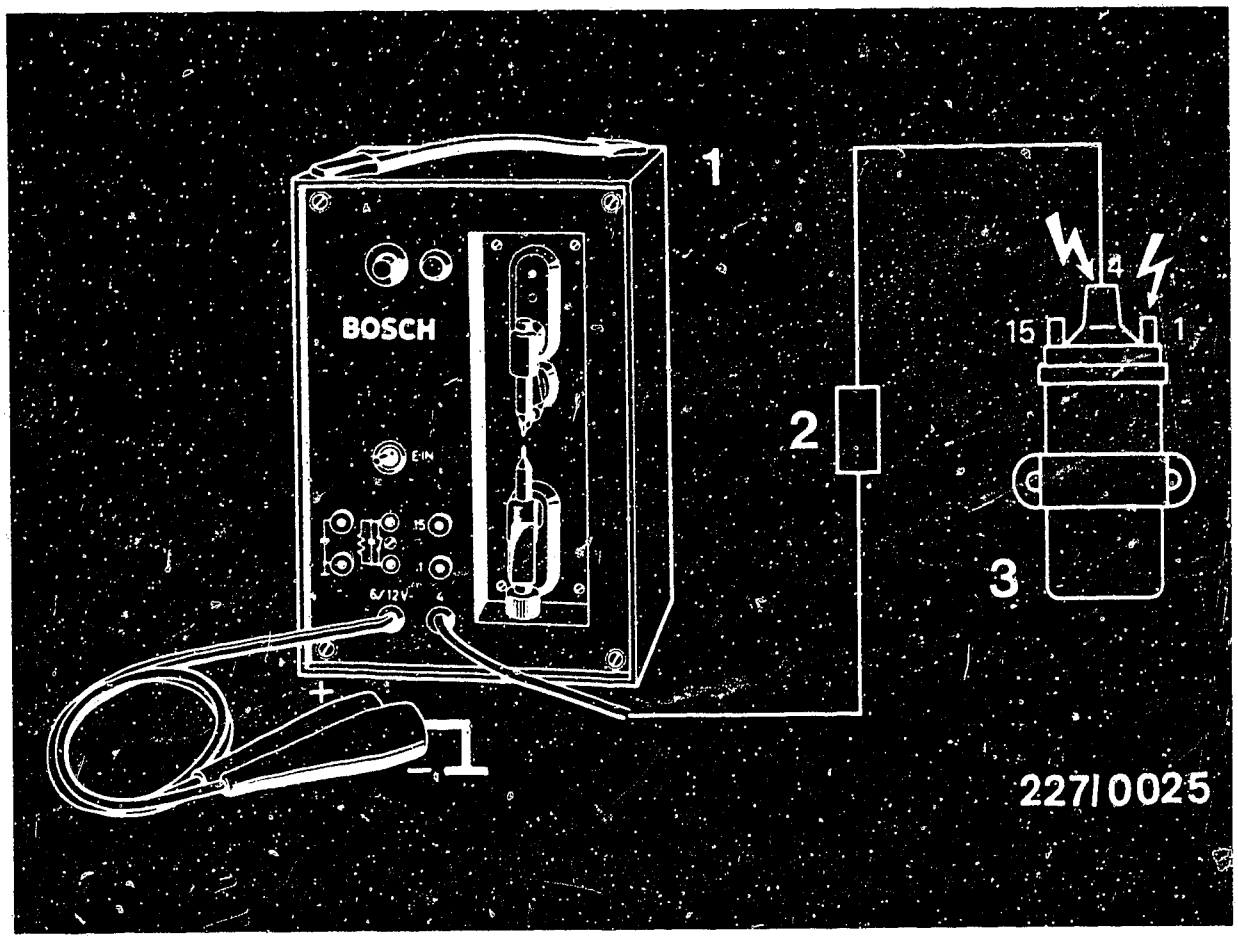
- No suppression capacitor may be connected to ignition coil term. 1.

- Ignition coil terminal 1 must not be brought into contact with ground as a theft-proofing measure (ignition coil will be destroyed when ignition is switched on).

- No battery + or test lamp must be connected to ignition coil terminal 1 (Control unit will be destroyed).

- Ignition cable from ignition coil terminal 4 to ignition distributor terminal 4 must not be disconnected during operation.

- There must be no arcing between ignition coil term. 4 and ignition coil term. 1 and 15. Ignition pulse generator and control unit may be destroyed.



1 = Spark gap
2 = 5 kΩ sleeve-type suppressor
3 = Ignition coil

= Dangerous voltages (400 V - 25 kV)

- In order to prevent irreparable damage to the control unit, when using a spark gap, an interference-suppression resistor of at least 2 kΩ must be connected between spark gap and ignition coil term. 4, e.g. sleeve-type suppressor (5 kΩ) 0 356 500 001.

- In order to prevent irreparable damage to the control unit, the secondary side of the ignition system must have at least 2 kΩ interference suppression whereby the original distributor rotor with 1 kΩ interference-suppression resistor must be installed (even in the case of radio and spark interference suppression do not use a 5 kΩ distributor rotor).

- No external voltage, e.g. ohmmeter, may be connected to ignition pulse generator (Hall generator).

Caution when changing measuring ranges.

- No test lamp may be connected to ignition distributor connector (control unit will be destroyed).

- Arcing or a breakdown of insulation at the distributor cap (poor insulation) may lead to the destruction of ignition pulse generator and control unit.

- Do not disconnect the battery with the engine running.

- Incorrect polarity of the battery may lead to the destruction of ignition pulse generator, ignition distributor, control unit and ignition coil.

- Do not use a starting aid with more than 16 V or a fast charger for starting.

8. Trouble-shooting program

8.1 Procedure - trouble-shooting chart

The trouble-shooting chart starting on Coordinate B 3 contains fault symptoms, cause of fault, test instructions and coordinate references.

The possible cause of the fault should be selected from the trouble-shooting chart in accordance with the customer complaint (fault symptom).

If the cause of the fault is not clear, start testing with the detailed, self-contained trouble-shooting program beginning on Coordinate B 7.

If the cause of the fault is clear from the trouble-shooting chart, direct trouble-shooting is possible by going to the stated coordinate without having to perform the entire trouble-shooting program for each fault.
If there is no coordinate reference, trouble-shooting must be performed in accordance with the "Test instructions" column.

8.2 Procedure - trouble-shooting program

The trouble-shooting program starting on Coordinate B 7 is divided into 3 rows of boxes.

The left-hand row contains test instructions and test specifications.

The center row contains repair instructions.

The right-hand row contains the illustrations/terminal diagrams belonging to the text and the explanations of the items in the picture.

If the questions asked in the left-hand row can be answered conclusively with "yes", then proceed to the next test down.

If the answer to the question is "no", branch to the center row and carry out the tests given there.

8.3 Before testing, make sure of the following:

Battery fully charged, fuel system O.K., engine mechanically O.K. (e. g. compression, valve clearance etc.). Ambient temperature/ignition system temperature 0^{o} to 100^{o} C (temperature has a considerable effect on measured values).

Trouble-shooting chart

Customer complaint (fault symptom)

1. Starting motor operates, but engine fails to start
2. Rough idling
3. Poor throttle response
4. Engine lacks power
5. Misfiring
6. Fuel consumption too high
7. Engine pings when accelerating
8. Backfiring
9. Engine becomes too hot

1	2	3	4	5	6	7	8	9	Cause of fault	Test instructions	Coordinate
●	●	●	●	●	●	●	●	●	Not clear	Perform detailed trouble-shooting	B 7
●	●	●	●	●	●		●		Spark plugs defective	Assess using ignition oscillogram or remove spark plug and make visual examination.	-----
●	●	●	●	●	●	●	●	●	Basic ignition timing incorrect	-	B 15
●	●	●	●	●					Shunt on secondary side	Assess ignition coil, ignition distributor, ignition harness and spark plug using ignition oscillogram or make visual examination.	-----
●	●	●	●	●					Open circuit on secondary side	Assess ignition coil, ignition distributor, ignition harness and spark plug using ignition oscillogram, or test for continuity using ohm-meter.	-----
●									Open circuit on primary side	-	C 1
●	●	●	●	●					Ignition coil defective	-	B 9

Trouble-shooting chart (continued)

Customer complaint (fault symptom)

1. Starting motor operates, but engine fails to start	2. Rough idling	3. Poor throttle response (flat spot during acceleration)	4. Engine lacks power	5. Misfiring	6. Fuel consumption too high	7. Engine pings when accelerating	8. Backfiring	9. Engine becomes too hot	Cause of fault	Test instructions	Coordinates
		●	●	●	●				Interference-suppression resistors defective	Assess by means of ignition oscillogram or resistance measurement	----
	●	●	●		●	●		●	Vacuum sensor, including hose connection, defective	-	B 21
	●	●	●		●		●	●	Temperature sensor defective	-	B 19
●									Control unit defective	-	B 11
		●	●	●					Control unit defective	-	B 23
●									Distributor ignition pulse generator defective	-	C 3 C 5 C 7
●									Firing sequence incorrect	Firing sequence 1-3-4-2	----

yes

Test primary signal. If no oscilloscope or tachometer available, check whether ignition spark across spark gap.

Primary signal testing with oscilloscope
Connect oscilloscope to ignition coil as per operating instructions.
Start engine.
Oscilloscope must indicate a primary voltage (of any value).

Primary signal testing with tachometer
Connect tachometer to ignition coil as per operating instructions.
Start engine.
Tachometer must indicate a reading (of any value).

Ignition spark testing with spark gap
Remove H.T. ignition cable terminal 4 from ignition coil.
Connect spark gap including sleeve-type suppressor (5 kΩ) to ignition coil.
Adjust spark gap to 5 mm.
Start engine.
There must be sparks across the spark gap.

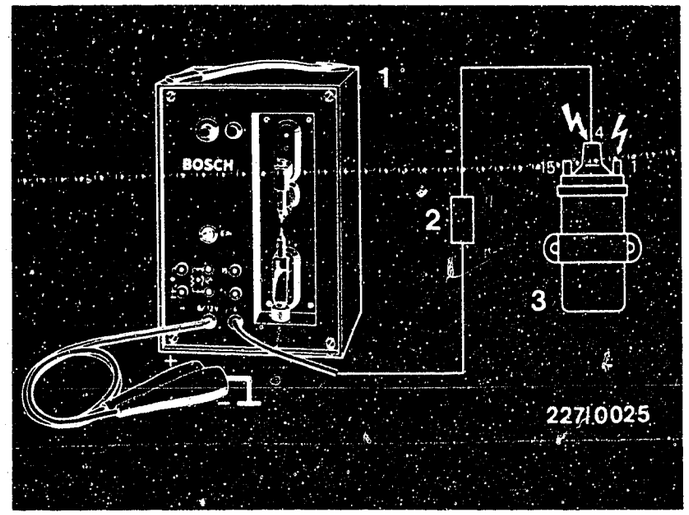
Primary signal present or ignition sparks across spark gap?

yes

Continued on B 9 / B 10

If no primary signal or no ignition spark, continue testing at C 1.

Tests from B 9 onwards not necessary.



1 = Spark gap
2 = 5 kΩ sleeve-type suppressor
3 = Ignition coil

= dangerous voltages (400 V - 25 kV)

yes

Check distributor cap, distributor rotor, H.T. ignition cables and spark plugs.

High-tension side O.K.?

→ Repair high-tension side.

yes

Test ignition coil.

Visual examination:
Remove protective cap from ignition coil and check whether plug is in position and whether any sealing compound has escaped.

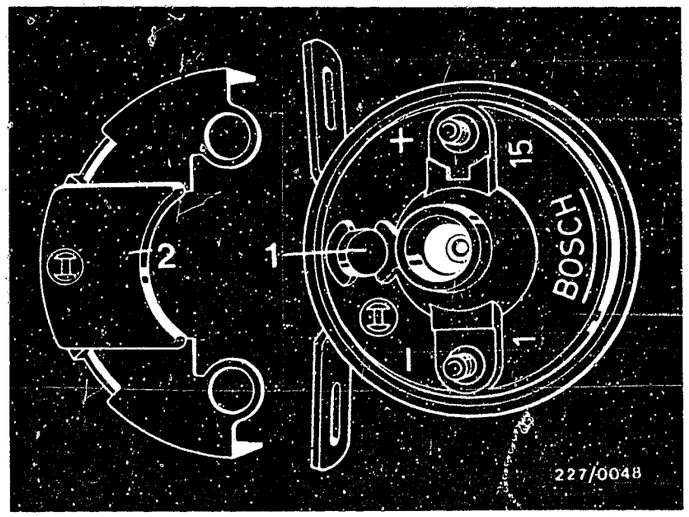
Electrical test:
Ignition coil primary (Terminals 15 and 1) 0,5 ... 0,9 Ω (Take resistance of test lead with test prods into account). Ignition coil secondary (terminals 1 and 4) 2,4 ... 4,4 kΩ .

Plug in position? No sealing compound escaped? Resistance values O. K.?

→
1. If plug is not in position and/or sealing compound has escaped, then replace control unit and ignition coil.
2. If resistance values are not O.K., then replace ignition coil.

yes

Continued on B 11 / B 12



1 = Plug
2 = Protective cap

yes

Engine running? — no → no

Test step 1

Remove cap and dust-protection cover from ignition distributor.

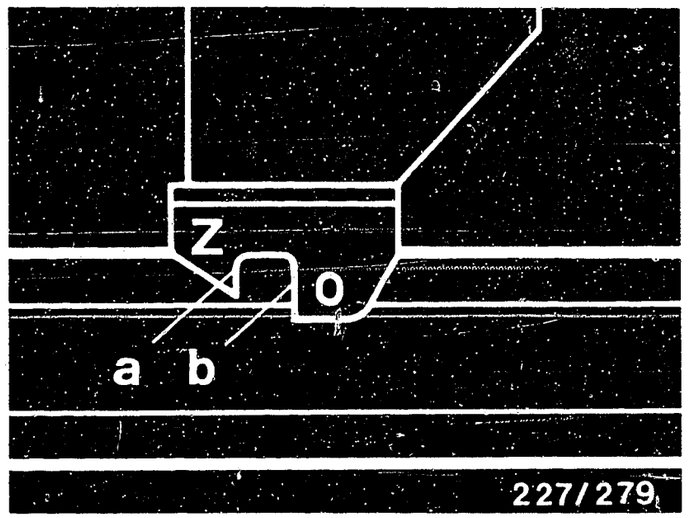
Set cylinder 1 to TDC. See top picture for mark (V-belt pulley).

The distributor rotor must be positioned such that the center of the distributor rotor electrode points toward the mark on the housing for cylinder 1.
See arrows in bottom picture.

Adjust the ignition distributor.

yes

Continued on B 13 / B 14



a = Reference edge - ignition timing
b = Reference edge
Top dead centre



Continued

Test step 2

Disconnect negative and positive cables from battery. Remove control-unit plug. Switch on ignition.

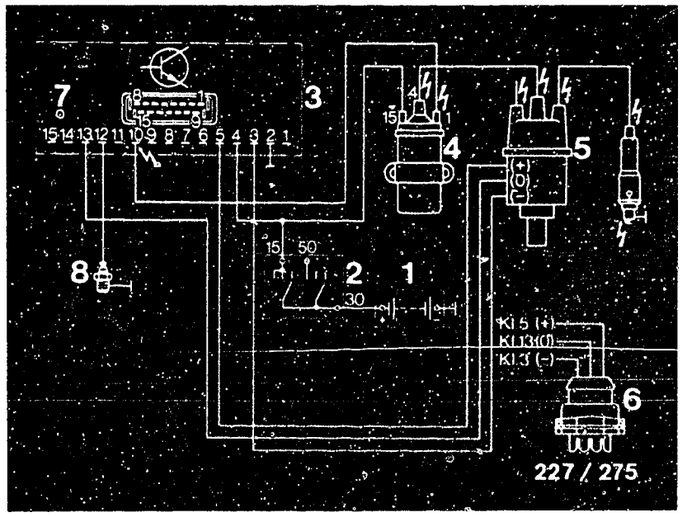
1. Test for contact resistance in cables from positive battery terminal to control-unit plug term. 4 including cables from negative battery terminal to control-unit plug term. 2. Total contact resistance max. 0.3 Ω (take resistance of test lead with test prod into account).
Eliminate contact resistance.

2. Test for contact resistance in cables from positive battery terminal to ignition coil term. 15 as well as cable from ignition coil term. 1 to control-unit plug term. 10. Total contact resistance max. 0.3 Ω (take resistance of test lead with test prods into account).
Eliminate contact resistance.

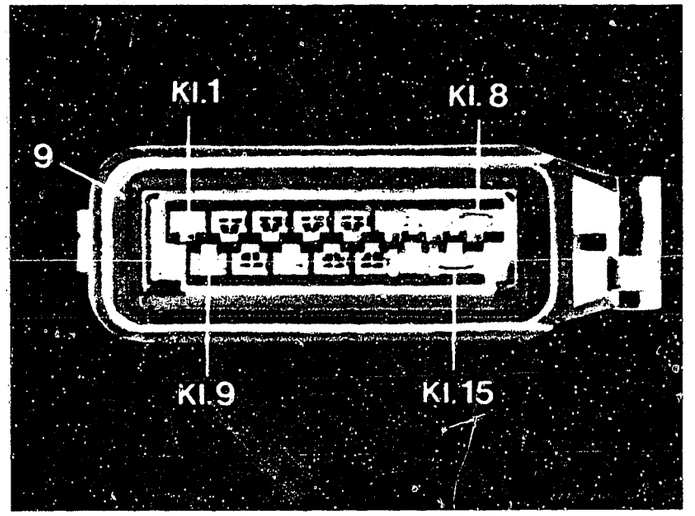
If test steps 1 and 2 O.K., replace control unit.

yes

Continued on B 15 / B 16



1 = Battery
2 = Ignition and starting switch
3 = Control unit
4 = Ignition coil
5 = Ignition distributor
6 = Ignition distributor connector
7 = Vacuum connection
8 = Temperature sensor
⚡ = Dangerous voltages (400 V - 25 kV)
9 = Control-unit plug



yes

Test basic ignition timing.
(If there is clearly an incorrect indication of engine speed on testers, connect in a series resistor or convert motortester).
Remove lead from temperature sensor. See top picture.
Caution: Do not bring disconnected lead of temperature sensor into contact with vehicle ground or with coolant hoses (incorrect measurement).
Operate engine between 2000 and 2500 min^{-1}.
Basic ignition timing must be 5 ± 1° BTDC.
See bottom picture.
Basic ignition timing correct?

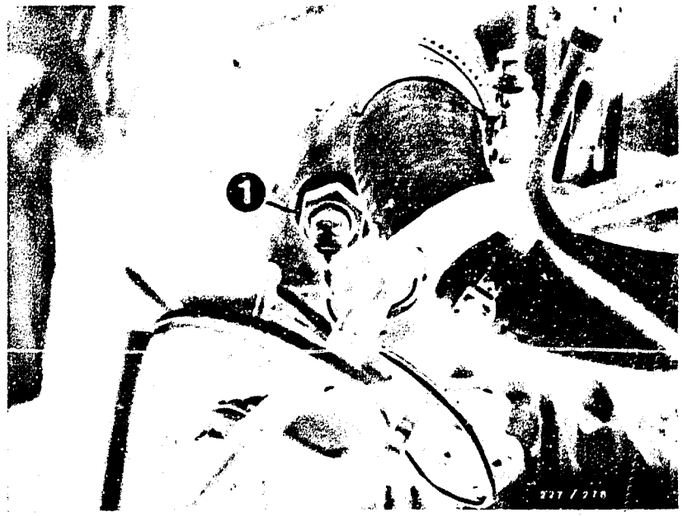
no → Loosen ignition distributor mounting and turn ignition distributor so that 5° BTDC is reached.

yes

Connect lead to temperature sensor.

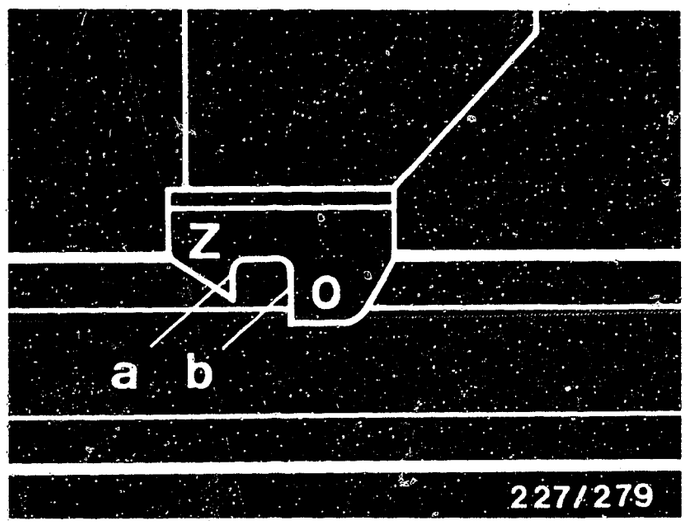
yes

Continued on B 17 / B 18



1 = Temperature sensor

a = Reference edge - ignition timing
b = Reference edge - Top dead centre



yes

Test ignition pulse generator voltage supply.
Push back rubber sleeve of ignition distributor connector.
Connect voltmeter with test prods to term. 5 and term. 3 (ensure good contacting).
Operate engine at idle.
Measured voltage must be at least 10 V.
Voltage O.K.?

no

1. Disconnect negative and positive cables from battery. Remove control-unit plug. Switch on ignition. Test for contact resistance in cables from positive battery terminal to control-unit plug term. 4 including cables from negative battery terminal to control-unit plug term. 2.
Total contact resistance max. 0.3 Ω (take resistance of test lead with test prods into account).
Eliminate contact resistance.
2. If contact resistance is less than 0.3 Ω, replace control unit.

yes

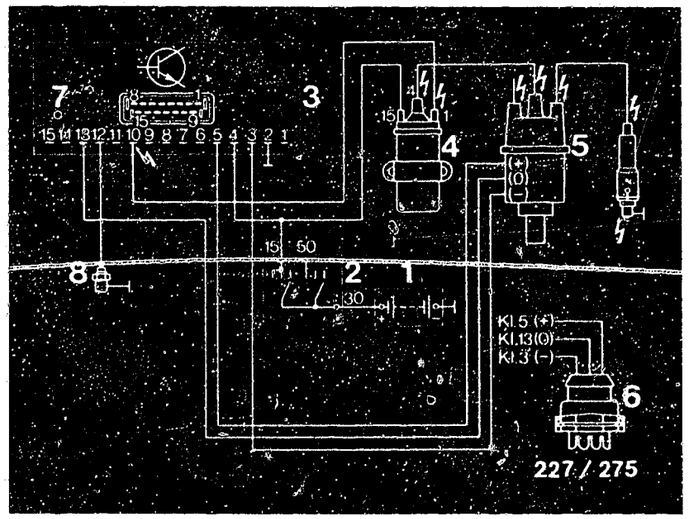
Test ignition coil voltage supply.
Connect voltmeter to ignition coil term. 15 and negative battery terminal.
Operate engine at idle. Measured voltage must be at least 10 V.
Voltage O.K.?

no

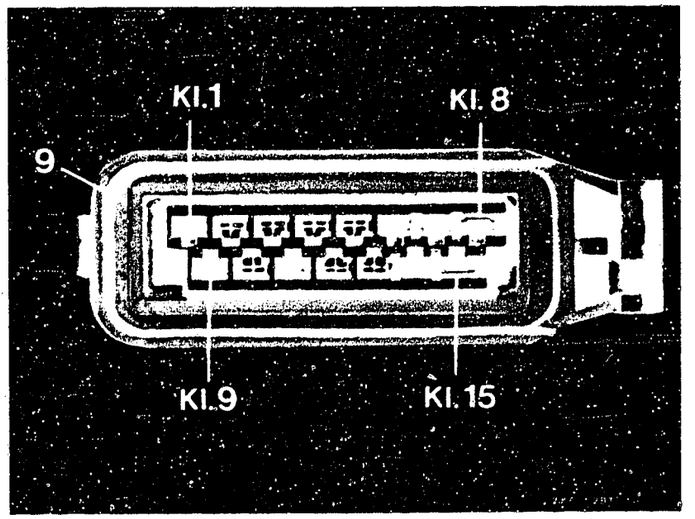
Disconnect positive cable of battery. Switch on ignition.
Test for contact resistance in cables from positive battery terminal to ignition coil term. 15.
Contact resistance max. 0.3 Ω (take resistance of test lead with test prods into account).
Eliminate contact resistance.

yes

Continued on B 19 / B 20



1 = Battery
2 = Ignition and starting switch
3 = Control unit
4 = Ignition coil
5 = Ignition distributor
6 = Ignition distributor connector
7 = Vacuum connection
8 = Temperature sensor
ϟ = Dangerous voltages (400 V - 25 kV)
9 = Control-unit plug



yes

Test temperature sensor..
Connect ohmmeter to disconnected control-unit plug term. 12 and vehicle ground.
See table for resistance values.

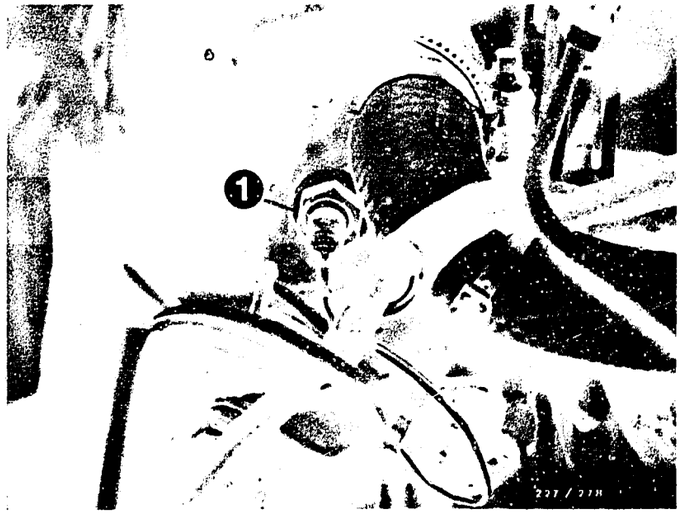
Coolant temperature	Resistance values
0 ° C	1.9...2.9 kΩ
+20 ° C	0.7...1.3 kΩ
+40 ° C	400...600 Ω
+60 ° C	195...295 Ω
+90 ° C	82...122 Ω

Resistance values O.K. at given coolant temperature?

no →

1. If ohmmeter indicates ∞, then test for open circuit in lead from temperature-sensor plug to control-unit plug term. 12. Eliminate open circuit.

2. If resistance values are incorrect, replace temperature sensor.



1 = Temperature sensor

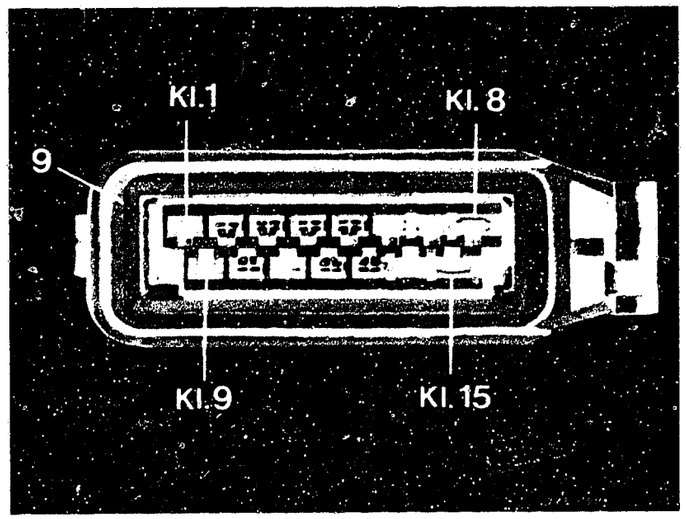
yes

Connect control-unit plug.

yes

Continued on B 21 / B 22

9 = Control-unit plug



yes

Test operation of vacuum sensor.

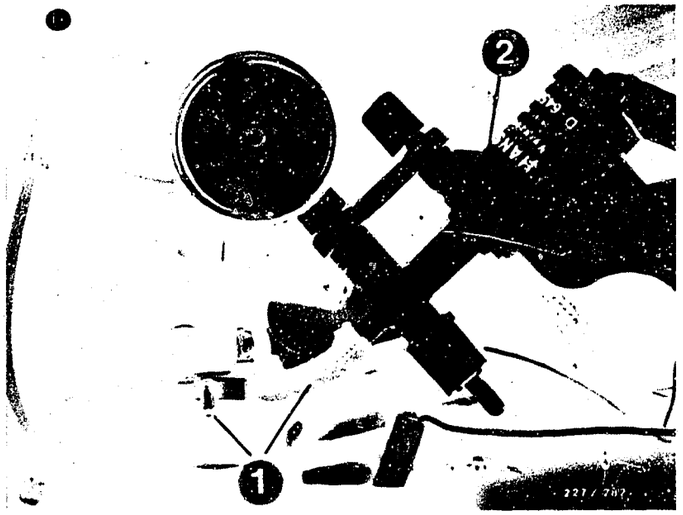
Remove vacuum hose from carburettor.

Connect vacuum pump to disconnected vacuum hose. See top picture.
Operate engine at idle.
Adjust manual adjustment (delay) on ignition timing light so that TDC is indicated. See bottom picture.
Using vacuum pump, build up vacuum of approx. 500 mbar.
Engine speed must rise and ignition timing must move away in advance direction.
Ignition timing moving toward advance?

no → Test vacuum hose for leaks.
Replace defective vacuum hose.
If there was no leak, replace control unit.

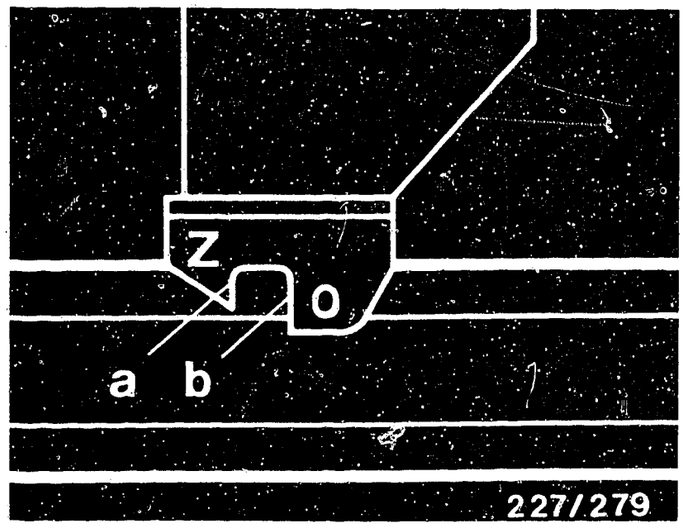
yes

Continued on B 23 / B 24



1 = Vacuum hose and carburettor connection
2 = Vacuum pump

a = Reference edge - ignition timing
b = Reference edge - top dead centre



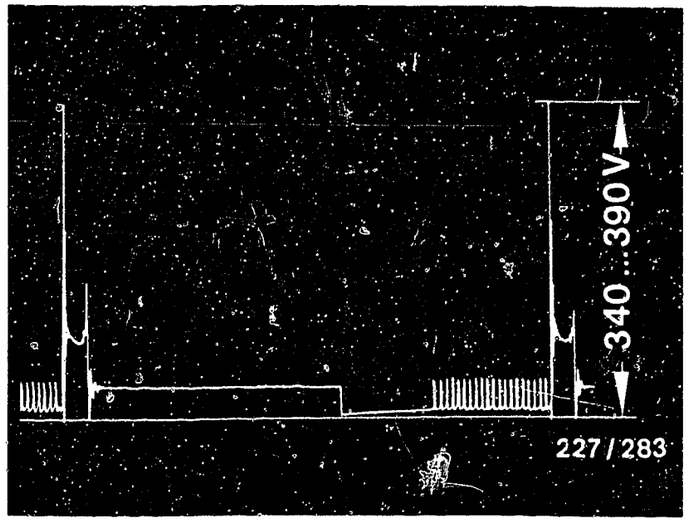
yes

Test primary voltage.

(If MOT series available).
Connect oscilloscope (e. g. MOT 201) to ignition coil as per operating instructions.
Allow engine to idle.
Measured primary voltage must be 340...390V. See graph.

Voltage correct?

→ Replace control unit



yes

Ignition system O.K.
Test completed
Tests starting at C 1 no longer necessary.

Note:
If customer complaint is not yet remedied, then check for further possible faults in the fuel system, or engine not mechanically O.K.

No primary signal or no ignition spark.

(Continued from B 7/B 8)

yes

Test control unit voltage supply.
Remove control-unit plug.
Connect voltmeter to control unit plug between term. 4 and term. 2.
Switch on ignition. Voltmeter must indicate battery voltage.
Voltage O.K.?

no → Test for open circuit in leads and terminals from ignition and starting switch to control-unit plug term. 4 including ground cable term. 2. Eliminate open circuit.

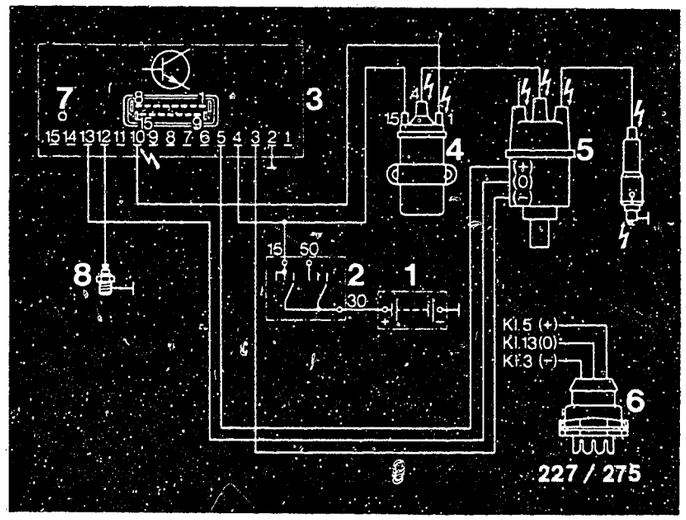
yes

Test primary circuit.
Connect voltmeter to disconnected control-unit plug between term. 10 and term. 2. Switch on ignition. Voltmeter must indicate battery voltage.
Voltage O.K.?

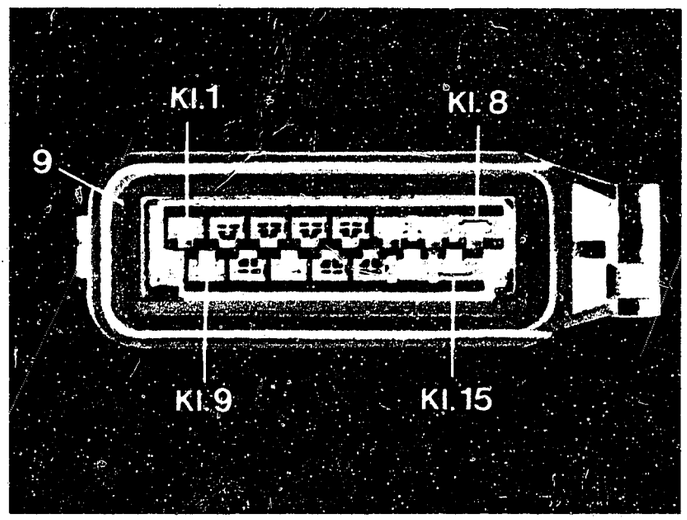
no → Test for open circuit in lead from ignition and starting switch to ignition coil term. 15, primary winding of ignition coil as well as lead from ignition coil term. 1 to control-unit plug term. 10 including ground cable term. 2. Eliminate open circuit.

yes

Continued on C 3/ C 4



1 = Battery
2 = Ignition and starting switch
3 = Control unit
4 = Ignition coil
5 = Ignition distributor
6 = Ignition distributor connector
7 = Vacuum connection
8 = Temperature sensor
⚡ = Dangerous voltages (400 - 25 kV)
9 = Control-unit plug



yes

Test voltage and control leads of ignition pulse generator.

Press back wire retaining clip of ignition distributor connector.

Remove ignition distributor connector. Connect ohmmeter with test prods, one after the other, to

Ignition distributor connector		Control-unit plug
Term. 5	and	Term. 5
Term. 3	and	Term. 3
Term. 13	and	Term. 13

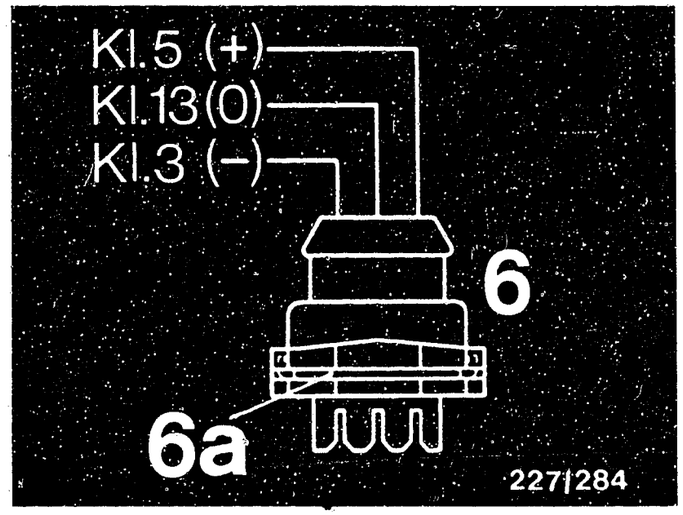
Ohmmeter must indicate continuity in each case.

O.K.?

no → Eliminate open circuit.

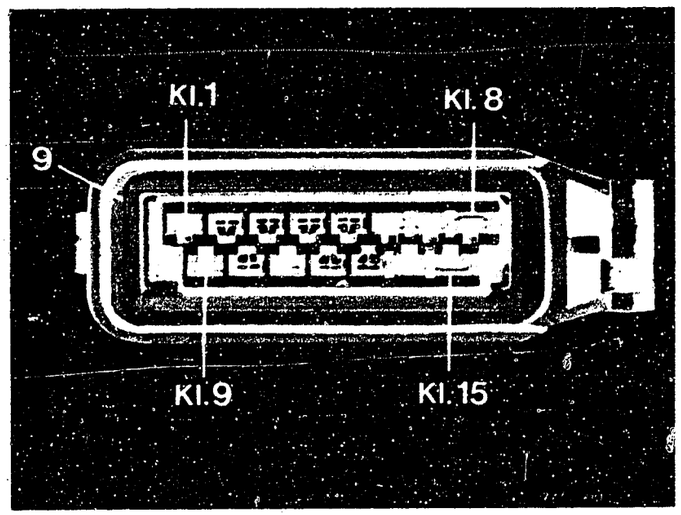
yes

Continued on C 5 / C 6



6 = Ignition distributor connector
6a = Wire retaining clip

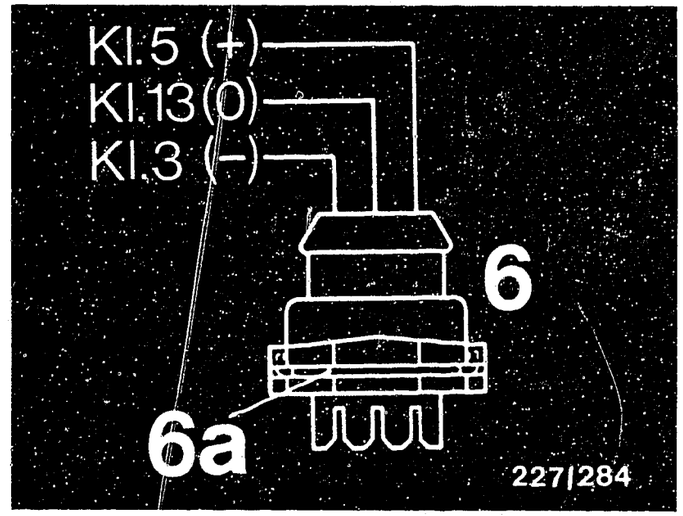
9 = Control-unit plug



yes

Test ignition pulse generator voltage supply.
Connect control-unit plug and ignition distributor connector.
Push back rubber sleeve on ignition distributor connector.
Connect the voltmeter with test prods to term. 5 and term. 3.
Switch on ignition.
Measured voltage must be at least 10 V.
Voltage O.K.?

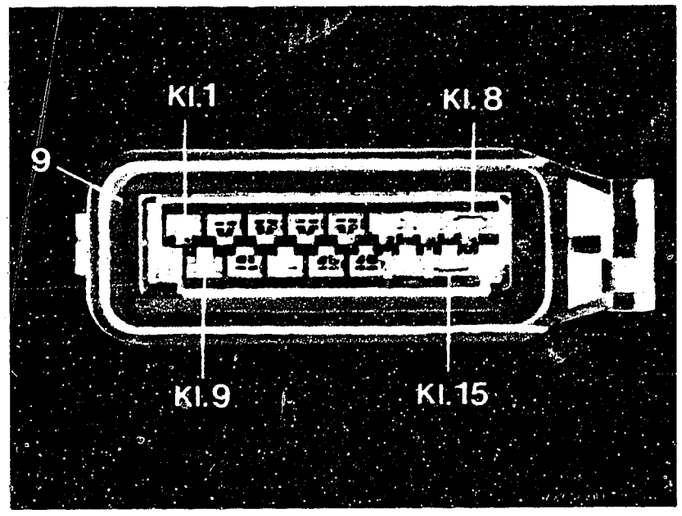
no → Replace control unit.



6 = Ignition distributor connector
6a = Wire retaining clip

yes

9 = Control unit plug



Continued on C 7 / C 8

yes

Test operation of pulse generator.

Control-unit plug and ignition distributor connector are connected.

Push back rubber sleeve of ignition-distributor connector.

Connect oscilloscope as per operating instructions with program switch in "special" position.

For example, MOT 201:

Red clip with test prod to ignition-distributor connector term. 13h (measured signal).

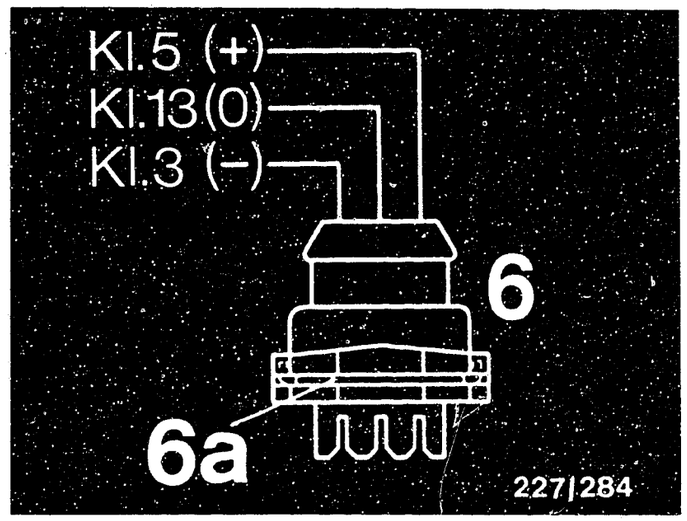
Black clip to ground.

Start engine.

The oscilloscope must show a rectangular pulse. See graph.

Rectangular pulse present?

no → Replace pulse generator/ignition distributor.

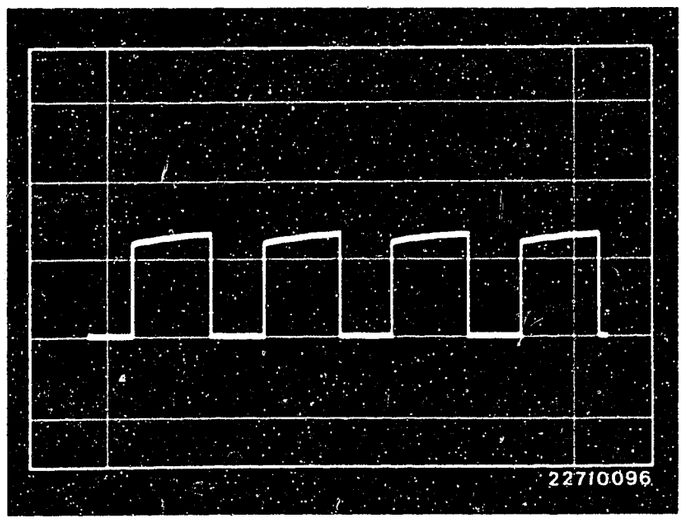


6 = Ignition distributor connector
6a = Wire retaining clip

yes

Continued on C 9 / C 10

Rectangular pulse



yes

Test ignition coil.

Visual examination:
Remove protective cap from ignition coil and check whether plug (see picture) is in position and whether any sealing compound has escaped.

Electrical test:
Ignition coil primary (term. 15 and term. 1) 0,5 ... 0,9 Ω
(take resistance of test lead with test prods into account).

Ignition coil secondary (term. 1 and term. 4) 2,4 ... 4,4 kΩ .

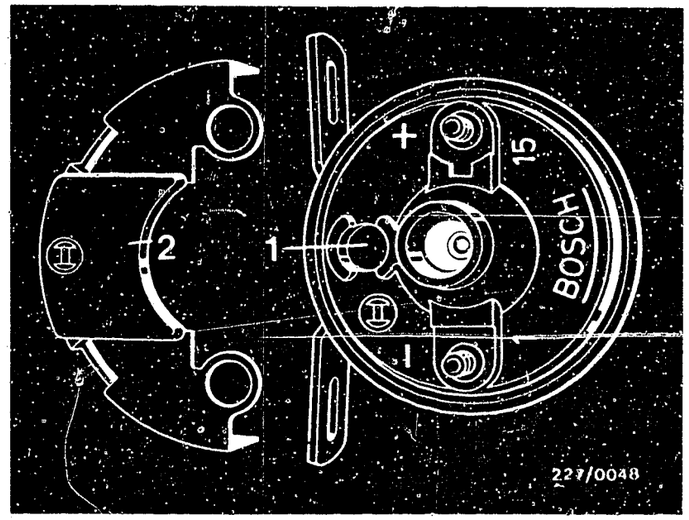
Plug in position? No sealing compound escaped?

Resistance value O.K.?

no →

1. If plug is not in position and/or sealing compound has escaped, replace control unit and ignition coil.

2. If resistance values are not O.K., replace ignition coil.



1 = Plug
2 = Protective cap

yes

Replace control unit.

Test completed.

Tests from B 9 not necessary.

Note:
If customer complaint is not yet remedied, then check for further possible faults in the fuel system, or engine not mechanically O. K.

After-sales Service

Technical Bulletin

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22

Danger of Accident on Semi-conductor Ignition Systems

VDT-I-227/102 B

11.1976

Please be sure to pass this bulletin on to your employees for their attention.

The increased demands made on their ignition systems by modern engines, and the wish for freedom from maintenance, led some time ago to manufactures starting to equip their vehicles with semi-conductor ignition systems as original equipment. In most cases the performance of nearly all makes of such systems is higher than that of conventional systems, and further improvements are to be expected. This means that semi-conductor ignition systems have reached the point where contact with "live" parts or contacts (whether on the primary side or the secondary side) can prove fatal.

In this connection we should like to point out to you that the laws valid in your country regarding work on high-voltage systems must be adhered to when working on, or testing, semi-conductor ignition systems.

As a matter of principle, when working on such ignition systems the ignition is to be switched off. Included in such work are the following operations:

- Connection of engine testing equipment (timing light, dwell-tach tester, ignition oscilloscope etc.).
- Replacement of ignition system parts (spark plugs, ignition coil, ignition distributor, H.T. ignition cables etc.).

If it is necessary to switch on the ignition in order to test the system or make adjustments on the engine (to the carburetor for instance), then lethal voltages are present throughout the entire system.

This means that the danger of accident exists not only at individual components in the system (e.g. ignition distributor, ignition coil, trigger box, ignition harness), but also at the wiring harness (e.g. connection for the tachometer, diagnostic connector), on terminals, and on test equipment.

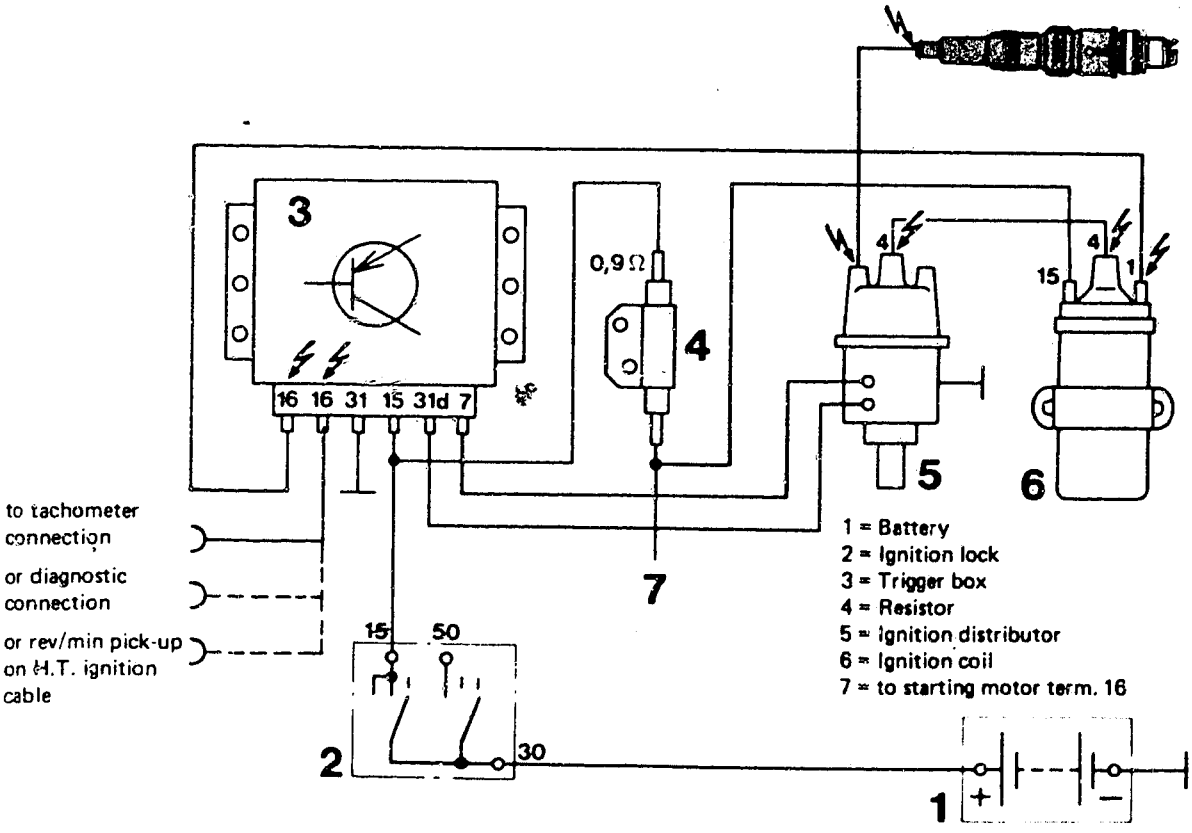
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In addition, in the case of the capacitor-discharge ignition system (CDI), danger of accident is also present under the following circumstances:

- Operation of the trigger box without the ignition transformer.
- At the trigger box, (removed), relatively soon after it has been switched off (capacitor discharge).

Below is a typical terminal diagram of a semi-conductor ignition system, the danger points are marked with red high-voltage arrows. We would point out that all semi-conductor ignition systems, even the older ones, are to be regarded as dangerous in the sense as defined by this bulletin.

Please address any queries or comments concerning the contents of this publication to our representative in your country.



Terminal diagram

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EFFECTS OF ELECTRICAL AND ELECTRONIC SYSTEMS ON HEART PACEMAKERS

e.g. ignition systems, Jetronic, Motronic, ABS

VDT-I-227/107 En

1.1981

Please ensure without fail that this Bulletin is passed on to your employees for their attention!

We have often been asked by some of our customers whether or not patients with heart pacemakers are endangered in any way by ignition systems. This theme was recently the subject of an examination carried out by the Ignition System Development Department of Robert Bosch GmbH in conjunction with Dr. Thull, lecturer at the Central Institute for Biomedical Technology at the University of Erlangen-Nürnberg and Biotronic GmbH & Co. of Berlin, a manufacturer of heart pacemakers. The magazine "Biomedizinischen Technik" (5/80) listed the results.

The most important discoveries in this practice can be summarized from the examination report as follows:-

1. Heart pacemakers corresponding to the latest state of the art are not affected by radiation (electromagnetic fields) from ignition systems.
2. With a stationary engine and the ignition switched off the heart pacemaker is not affected by any part of the ignition system, even when unintentionally touched. Maintenance work in the engine compartment, for example, can then be carried out without any danger.
3. With the engine running or stationary with the ignition switched on, touching current-carrying parts of the ignition system, as well as parts of any other electrical system, presents a certain danger for everybody. The heart pacemaker can here be affected under certain conditions (voltage, current and frequency).
 Patients with heart pacemakers should therefore at all costs avoid touching current-carrying parts of electrical systems.
4. Furthermore, patients with heart pacemakers are more inclined to psychic shock effects than other people, even when they receive just a harmless electric shock, because many such patients are conscious of the increased danger to the cardiac activity.

We therefore consider it inadvisable for patients with heart pacemakers to be employed in workshops or on vehicles where ignition systems are being tested or repaired. If any members of your staff have heart pacemakers please carry out the necessary measures.

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We would like to add that heart pacemakers are not expected to be affected in any way by interference from other electronic products and systems which we manufacture, such as the Antiskid System (ABS), Jetronic, Motronic, because the much greater radiation intensity of the ignition systems examined in normal use has not caused any interference to heart pacemakers corresponding to the latest state of the art.

If you should receive questions on this matter from customers, please inform them accordingly.

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NEW DESIGNATIONS FOR IGNITION SYSTEMS

VDT-I-227/108 En
1.1983

The introduction of new ignition systems has made it necessary to reclassify all designations.

The designations listed below will be used immediately in KH workshop and sales literature.

Designation	Abbrev'd code	Meaning	Switching	Ignition control and spark advance	High-voltage distribution
Coil ignition	SZ (CI)	---------	Mechanical (breaker points)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Transistorized coil ignition	TSZ-K (TCI-c)	K=breaker-triggered	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Trigger box with conventional circuit techniques	TSZ-I* (TCI-i)	I=Induction-type pulse generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
	TSZ-H	H=Hall generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Transistorized ignition	TZ-I* (TI-i)	I=Induction-type pulse generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
(Trigger box in Hybrid technique)	TZ-H* (TI-h)	H=Hall generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)

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Designation	Abbrev'd code	Meaning	Switching	Ignition control and spark advance	High-voltage distribution
Breakerless semiconductor ignition with or without knock control	EZ EZ-K	- K=Knock control	Electronic (trigger box or control unit)	Electronic (control unit)	Mechanical (ignition distributor or high-voltage distributor)
Distributor-less ignition with or without knock control	VZ VZ-K	- K=Knock control	Electronic (control unit)	Electronic (control unit)	Electronic (dual-spark ignition coil, or 1 ignition coil for each spark plug)

*Note: The ignition system can also be equipped with a DLS unit (digital idle stabilization) or with an ELS unit (electronic idle stabilization) or with an ESV unit (electronic ignition retardation).

After-sales Service

Motor Vehicle Service Information

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INCORRECT DISPLAY OF ROTATIONAL SPEED AND DWELL ANGLE ONLY WITH TRIGGER BOXES 0 227 100 ... (TCI-i, TCI-h) WITH CURRENT LIMITATION

VDT-I-Gen. 030 En
6.80
Supersedes Ed. 3.80

For additional information see VDT-I-Gen. 032 En

1. General

In comparison with conventional ignition systems, transistorized ignition systems with current limitation have different primary voltage characteristics. During the dwell period the voltage at terminal 1 of the ignition coil may assume values from 1.5 V to battery voltage (or greater). This may lead to an incorrect display of rotational speed and dwell angle when testing the ignition system. However, there is no functional defect in the ignition system, and, for this reason, the trigger box must not be replaced. Incorrect displays may occur with the testers listed below:

MOT	001.00 001.01 001.02 001.04 002.00	Rotational-speed display O.K. with these testers	KTE	001.00 001.02 001.03

By now, the following vehicles may be fitted with breakerless ignition systems with current limitation:

Audi	(Bosch/Fairchild-ignition system)	Mazda	(Mitsubishi ignition system)
BMW	(Bosch ignition system)	Mitsubishi	(Mitsubishi ignition system)
Citroen	(Delco ignition system)	Nissan-Datsun	(Hitachi ignition system)
Fiat	(Delco ignition system)	Peugeot	(Bosch ignition system)
Ford	(Delco ignition system)	VW	(Bosch/Fairchild ignition system)
General-Motors	(HEI-ignition system)	Bosch transistorized ignition system for retrofitting 0 227 100 920	

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2. Test instructions

2.1 Rotational speed

Incorrect rotational-speed display can be recognized as follows:

If one starts at the idle speed and slowly increases the engine speed, then the incorrect display can be recognized by an abrupt reduction in the rotational-speed display (e.g. from 2400 min^{-1} to 1200 min^{-1}).

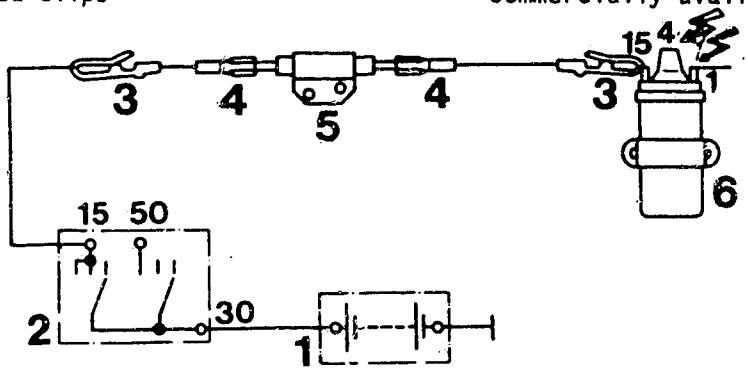
It is, however, possible to attain correct rot.-speed measurements as follows:

Connect a ballast resistor of 0.9 or 1.0 Ohm (see Fig.) in series in the line to term. 15 of the ignition coil (take care not to cause a short circuit). After the rotational-speed measurement, the ballast resistor must be removed (otherwise starting difficulties and misfiring). Connect tester as per operating instructions.

Suggestion for user manufacture

Required parts:

1 ballast resistor 0.9 Ohm	Part No. 0 227 900 002
or	
1 ballast resistor 1.0 Ohm	Part No. 0 227 900 101
2 blade receptacles e.g.	Part No. 1 901 355 881
approx. 0.2 m cable, 1.5 mm^2 e.g.	Part No. 6 210 150 150
2 insulated clips	Commercially available



1 = Battery
2 = Ignition switch
3 = Clips
4 = Blade receptacle
5 = Ballast resistor
6 = Ignition coil

approx. 400 V

approx. 25 kV

2.2 Dwell angle

The dwell angle is electronically controlled. A measurement of the dwell angle is no longer performed.

2.3 Ignition point

Is displayed correctly. Connect tester as per operating instructions.

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Motor Vehicle Service Information

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MOTORTESTER CONVERSION
Incorrect display of rotational speed, dwell angle and ignition point only with trigger boxes 0 227 100 ... (TCI-i, TCI-h) with current limitation

VDT-I-Gen. 032 En
6.80

For additional information see VDT-I-Gen. 030 of 6.80

Re.: Motortester EFAW 268
268 S 10
269
214 B
AE 2000

1. General

Please make sure that the above-mentioned motortesters in your workshop and at your customers (e.g. motor vehicle workshops, oil companies, gas stations, vocational schools etc.) are converted. The conversion is subject to payment and is carried out by the K7 after-sales service of the responsible BG. The standard time is 15 work units (with fitting of switch).

2. Why motortester conversion?

In comparison with conventional ignition systems, transistorized ignition systems with current limitation have different primary voltage characteristics. During the dwell period the voltage at terminal 1 of the ignition coil may assume values from 1.5 V to battery voltage (or greater). This may lead to an incorrect display of rotational speed and dwell angle as well as to incorrect triggering of the meter when testing the ignition system. There is, however, no functional defect in the ignition system, and, for this reason, the trigger box must not be replaced. Since, with the above-listed motortesters, the timing light is triggered by the signal path dwell angle - meter, this incorrect triggering also leads to incorrect flashing and thus to an incorrect display of the advance angle.

3. Conversion measures

The situation is to be remedied by modifying the wiring of the testers so that the timing light is triggered by the clamp-on induction pickup and the pulse shaper stage.

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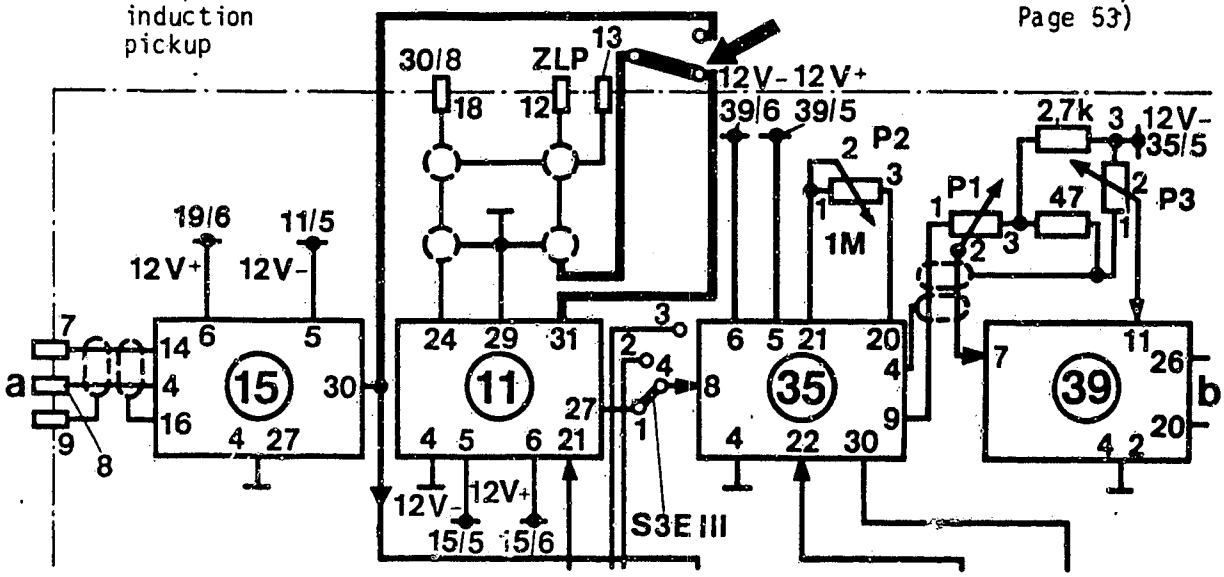
EFAW 268, 268 S 10, 269, AE 2000

Remove the line of the ZLP* from pin 31 of printed board 11 (coupling stage) and connect to pin 30 of printed board 15 (pulse shaper stage) via a switch with change-over contact (e.g. 0 341 500 803). In addition, a new line must be connected from pin 31 of printed board 11 to the other contact of the switch with change-over contact. Arrow points to switch with change-over contact.

* ZLP = timing light

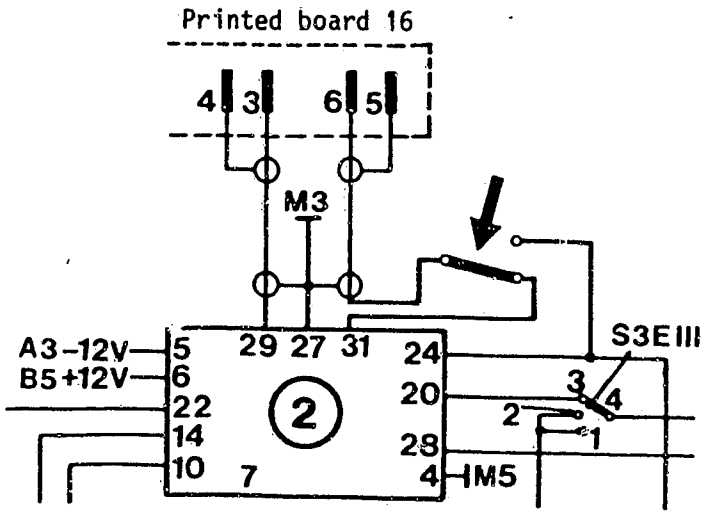
a = Clamp-on induction pickup

b = (Extract from WJF 508/1 Page 53)



EFAW 214 B

Remove the line from terminal 6 of printed board 16 to pin 31 of printed board 2 (coupling stage) and connect to pin 24 of the same printed board via a switch with change-over contact (e.g. 0 341 500 803). In addition, a new line must be connected from pin 31 of printed board 2 to the other contact of the switch with change-over contact. Arrow points to switch with change-over contact.



(Extract from WJF 503/1, Page 64)

By fitting the switch with change-over contact in the front panel of the motor-tester, it is possible to switch over from standard ignition systems to those with current limitation. We recommend that the switch positions be marked correspondingly: e.g. "standard" - "current limitation".
These conversion measures have already been published in the K7 information sheet KJF 28/7911.

4. Test instructions

4.1 Standard ignition systems

Switch position: "standard"
All other tester connections as per operating instructions.

4.2 Ignition systems with current limitation

Switch position: "current limitation"

In order to trigger the timing light, the induction-type pulse generator (clamp-on pickup or red pickup) must always be connected during the measurement.

The selector switch for ignition systems built into the motortester must be switched to standard coil ignition (not to TCI) with these ignition systems.

All other tester connections as per operating instructions.

The dwell angle is electronically controlled. A measurement of the dwell angle is no longer performed.

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Motor Vehicle Service Information

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TESTS ON ELECTRONIC IGNITION SYSTEMS
(TCI, TZ)
TESTER INSTRUCTIONS

VDT-I-Gen. 035 En
3.1981

The following tests are listed in older and current Tester operating instructions or in Trouble-shooting with the oscillograph.:

- "Separate ignition coil test" (concerns EFAW 213, 214, 268, AE 2000).
- Calculating the "ignition voltage reserve" (concerns EFAW 213, 214, 268, AE 2000 and MOT series).
- "Intensified insulation test" (concerns EFAW 213, 214, 268, AE 2000 and MOT series).

Nowadays transistorized ignition systems deliver more than 30,000 V secondary voltage.

To avoid damage to ignition coil, ignition cable and ignition distributor by voltage flashovers, the tests listed above should not be carried out on transistorized ignition systems.

The contents of this Service Information has already been published in the K7-Information K7-VJF 17/8012.

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Table of contents

Section	Coordinate
Structure of microfiche	A 1
1. Test specifications	A 2
2. Electrical terminal diagram ...	A 3
3. Installation position of components	A 4
4. Necessary test equipment, aids	A 7
5. Danger of accident on electronic ignition systems	A 8
6. Incorrect indication of engine speed, dwell angle and ignition point	A 11
7. Important vehicle information .	A 12
8. Trouble-shooting program	B 1
Direct trouble-shooting chart .	B 3
Detailed trouble-shooting chart if primary signal/ignition spark present	B 7
Detailed trouble-shooting chart if no primary signal/no ignition spark present	C 1
Technical Bulletin (danger of accident)	L 1
Technical Bulletin (influence of electrical and electronic systems on heart pacemakers)	L 3

Table of contents (continued)

Section	Coordinate
Technical Bulletin (new designations for ignition systems)	L 5
Motor Vehicle Service Information (incorrect indication of engine speed and dwell angle)	L 7
Motor Vehicle Service Information (motortester conversion)	L 9
Motor Vehicle Service Information (tests on electronic ignition systems)	L 12

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